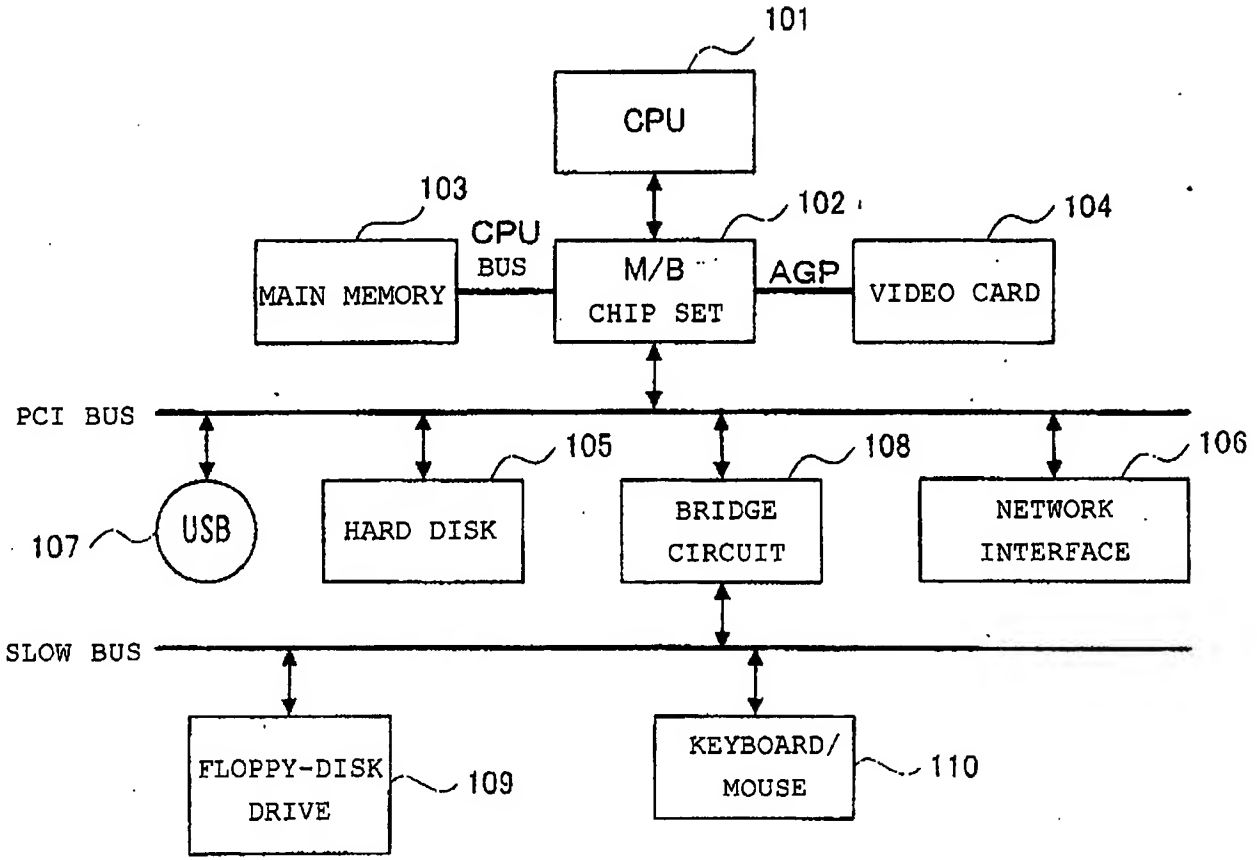
101
CPU
103
102
104
CPU
BUS
MAIN MEMORY
M/B
CHIP SET
AGP
VIDEO CARD
PCI BUS
105
108
106
107
USB
HARD DISK
BRIDGE
CIRCUIT
NETWORK
INTERFACE
SLOW BUS
FLOPPY-DISK
DRIVE
109
KEYBOARD/
MOUSE
110

FIG 1

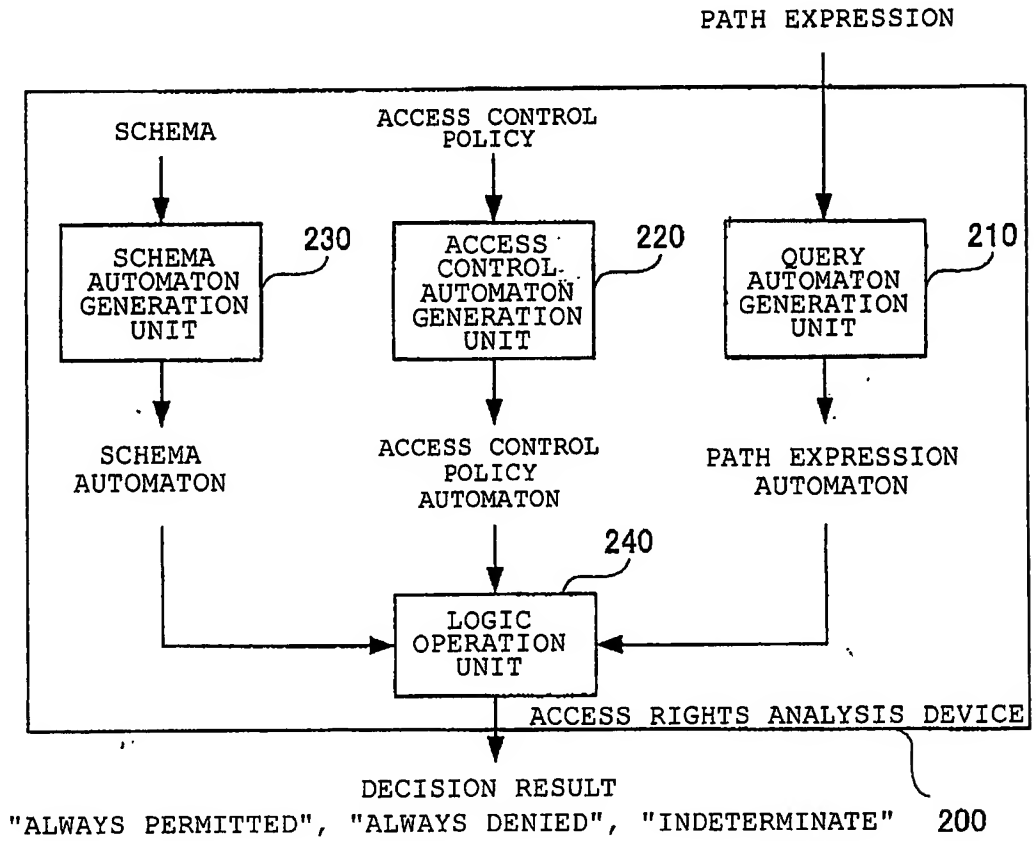
PATH EXPRESSION
SCHEMA
ACCESS CONTROL POLICY
SCHEMA AUTOMATON GENERATION UNIT
230
ACCESS CONTROL AUTOMATON GENERATION UNIT
220
QUERY AUTOMATON GENERATION UNIT
210
SCHEMA AUTOMATON
ACCESS CONTROL POLICY AUTOMATON
PATH EXPRESSION AUTOMATON
240
LOGIC OPERATION UNIT
ACCESS RIGHTS ANALYSIS DEVICE
DECISION RESULT
"ALWAYS PERMITTED", "ALWAYS DENIED", "INDETERMINATE"
200

FIG 2

```
<bib>
   <book>
       <title>TCP/IP illustrated</title>
       <author>W. Stevens</author>
       <price>50.00</price>
   </book>
   <book>
       <title>Data on the Web</title>
       <author>S. Abiteboul</author>
       <author>P. Buneman</author>
       <author>D. Suciu</author>
       <price>40.00</price>
   </book>
</bib>
```

FIG 3

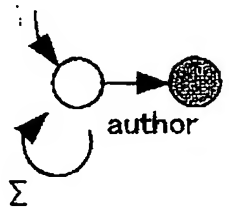

FIG 4

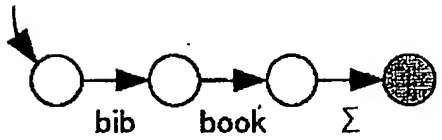

FIG 5

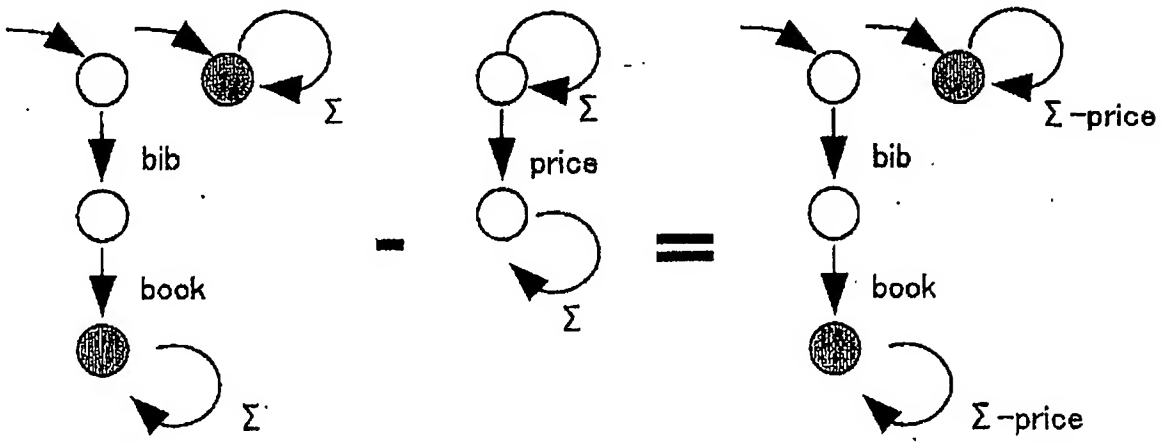

FIG 6

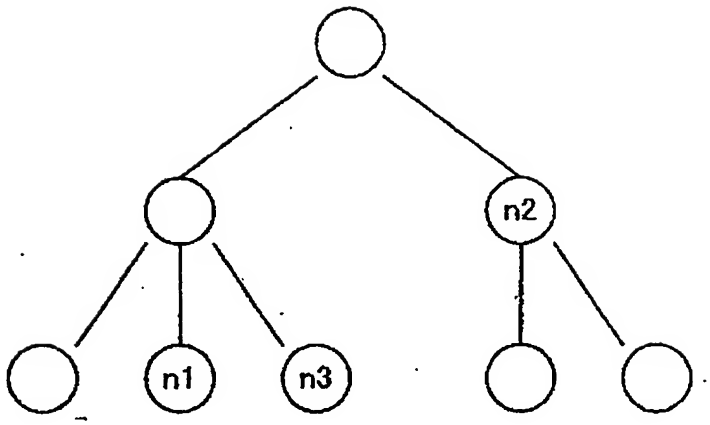

FIG 7

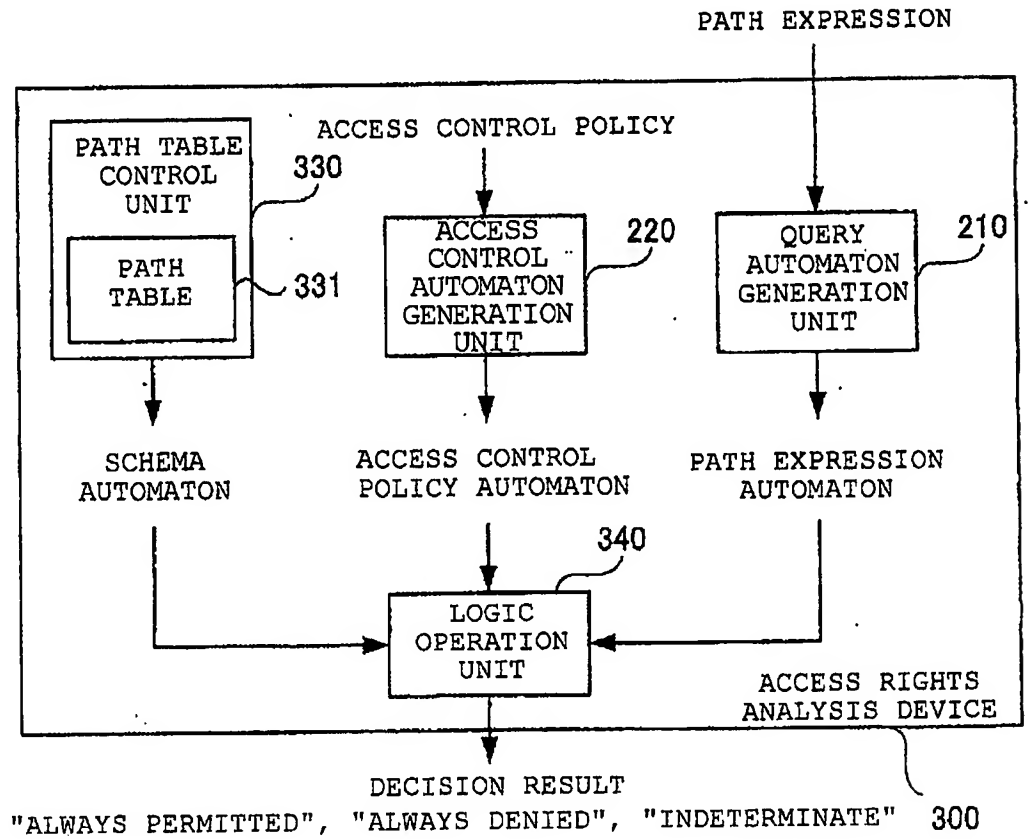
PATH EXPRESSION
ACCESS CONTROL POLICY
PATH TABLE CONTROL UNIT
330
PATH TABLE
331
ACCESS CONTROL AUTOMATON GENERATION UNIT
220
QUERY AUTOMATON GENERATION UNIT
210
SCHEMA AUTOMATON
ACCESS CONTROL POLICY AUTOMATON
PATH EXPRESSION AUTOMATON
340
LOGIC OPERATION UNIT
ACCESS RIGHTS ANALYSIS DEVICE
DECISION RESULT
"ALWAYS PERMITTED", "ALWAYS DENIED", "INDETERMINATE"
300

FIG 8

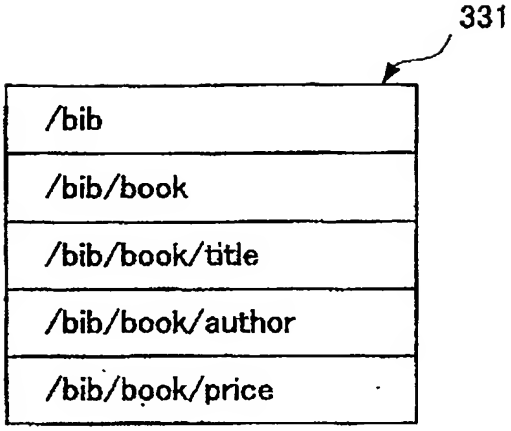
331
/bib
/bib/book
/bib/book/title
/bib/book/author
/bib/book/price

FIG 9

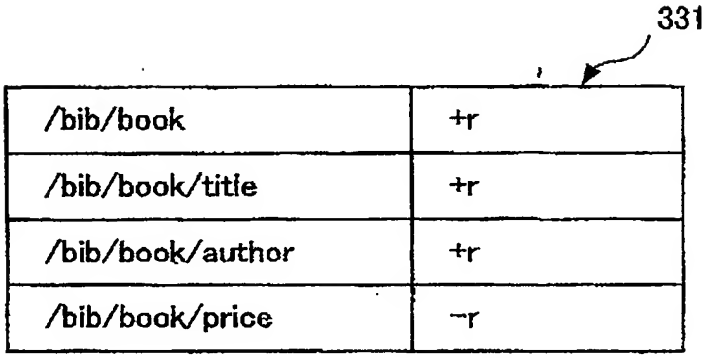
331
/bib/book
+r
/bib/book/title
+r
/bib/book/author
+r
/bib/book/price
−r

FIG 10

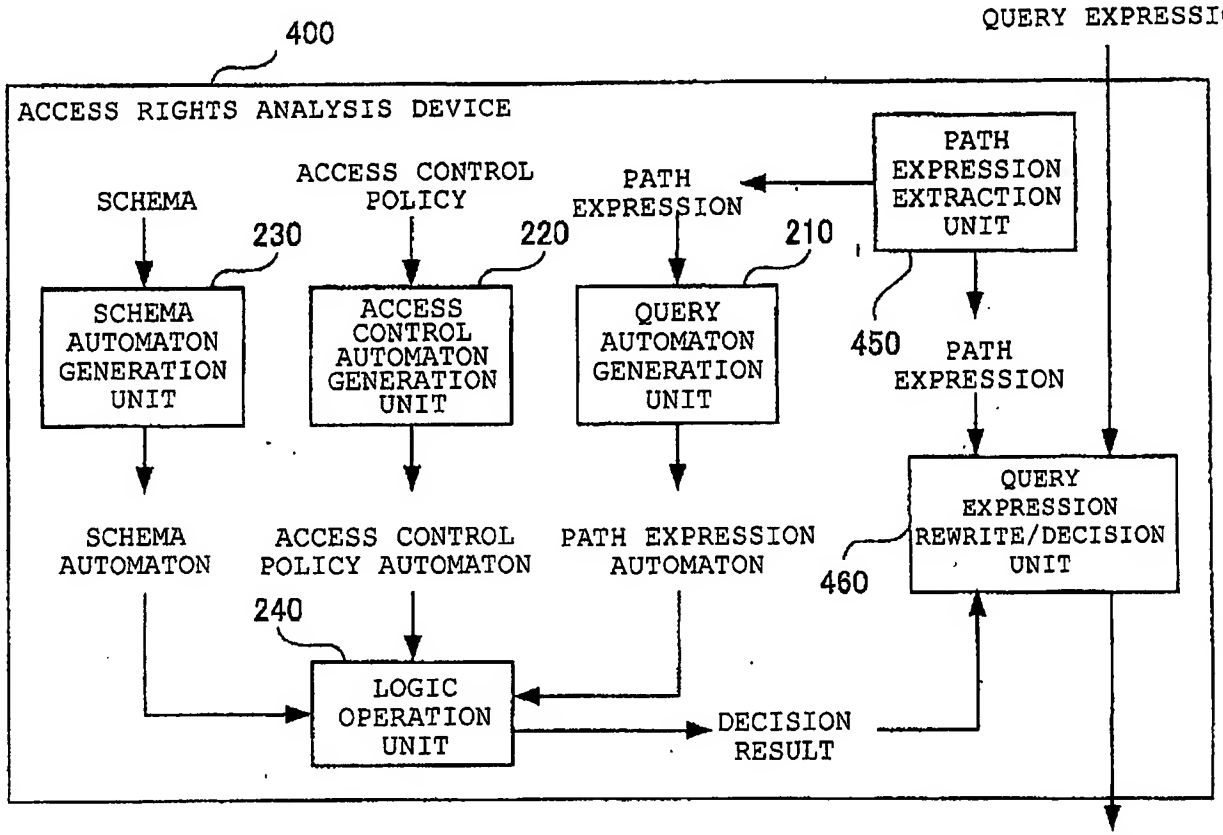
400
ACCESS RIGHTS ANALYSIS DEVICE
QUERY EXPRESSION
SCHEMA
ACCESS CONTROL POLICY
PATH EXPRESSION
PATH EXPRESSION EXTRACTION UNIT
230
220
210
SCHEMA AUTOMATON GENERATION UNIT
ACCESS CONTROL AUTOMATON GENERATION UNIT
QUERY AUTOMATON GENERATION UNIT
450
PATH EXPRESSION
QUERY EXPRESSION REWRITE/DECISION UNIT
460
SCHEMA AUTOMATON
ACCESS CONTROL POLICY AUTOMATON
PATH EXPRESSION AUTOMATON
240
LOGIC OPERATION UNIT
DECISION RESULT
REWRITTEN QUERY EXPRESSION,
DECISION RESULT
"ALWAYS PERMITTED", "INDETERMINATE"

FIG 11

```
1. <bib> {
2.  for $b in document("http://www.bn.com")/bib/book
3.  where $b/publisher = "Addison-Wesley" and $b/@year > 1991
4.  return
5.    <book year={ $b/@year }>
6.     { $b/title }
7.    </book>
8. }
9. </bib>
```

FIG 12

EXPRESSION ON QUERY EXPRESSION	RETRIEVED PATH EXPRESSION (XPath)	GROUP
2ND LINE, document .. /book	document ("http://www. bn. com") /bib/book	A
3RD LINE, $b/publisher	document ("http://www. bn. com") /bib/book/publisher	B
3RD LINE, $b/@year	document ("http://www. bn. com") /bib/book/@year	B
5TH LINE, $b/@year	document ("http://www. bn. com") /bib/book/@year	B
6TH LINE, $b/title	document ("http://www. bn. com") /bib/book/title	B

FIG 13

EXPRESSION ON QUERY EXPRESSION	RETRIEVED PATH EXPRESSION (XPath)	ANALYSIS RESULT
2ND LINE, document .. /book	document ("http://www. bn. com") /bib/book	ALWAYS PERMITTED
3RD LINE, $b/publisher	document ("http://www. bn. com") /bib/book/publisher	ALWAYS PERMITTED
3RD LINE, $b/@year	document ("http://www. bn. com") /bib/book/@year	ALWAYS DENIED
5TH LINE, $b/@year	document ("http://www. bn. com") /bib/book/@year	ALWAYS DENIED
6TH LINE, $b/title	document ("http://www. bn. com") /bib/book/title	ALWAYS PERMITTED

FIG 14

```
1. <bib> {
2.   for $b in document("http://www.bn.com")/bib/book
3.   where $b/publisher = "Addison-Wesley" and $empty > 1991
4.   return
5.     <book year={ $empty }>
6.       { $b/title }
7.     </book>
8. }
9. </bib>
```

FIG 15

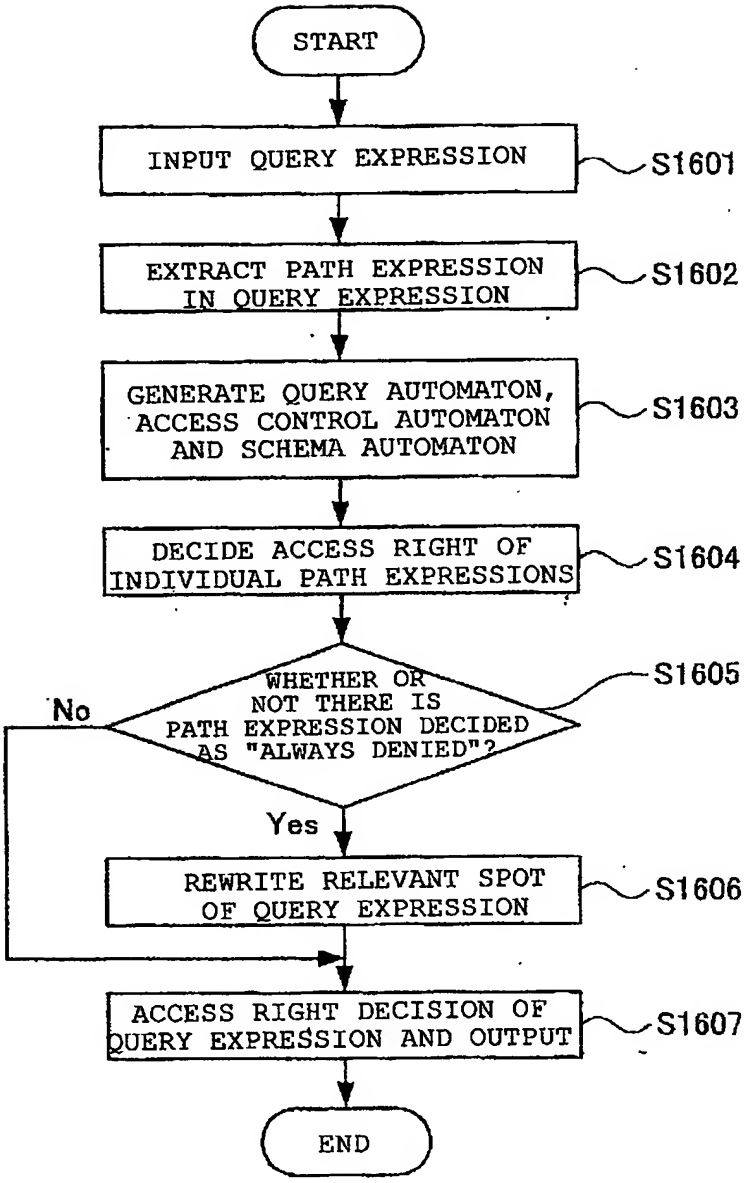
START
INPUT QUERY EXPRESSION
S1601
EXTRACT PATH EXPRESSION IN QUERY EXPRESSION
S1602
GENERATE QUERY AUTOMATON, ACCESS CONTROL AUTOMATON AND SCHEMA AUTOMATON
S1603
DECIDE ACCESS RIGHT OF INDIVIDUAL PATH EXPRESSIONS
S1604
WHETHER OR NOT THERE IS PATH EXPRESSION DECIDED AS "ALWAYS DENIED"?
S1605
No
Yes
REWRITE RELEVANT SPOT OF QUERY EXPRESSION
S1606
ACCESS RIGHT DECISION OF QUERY EXPRESSION AND OUTPUT
S1607
END

FIG 16

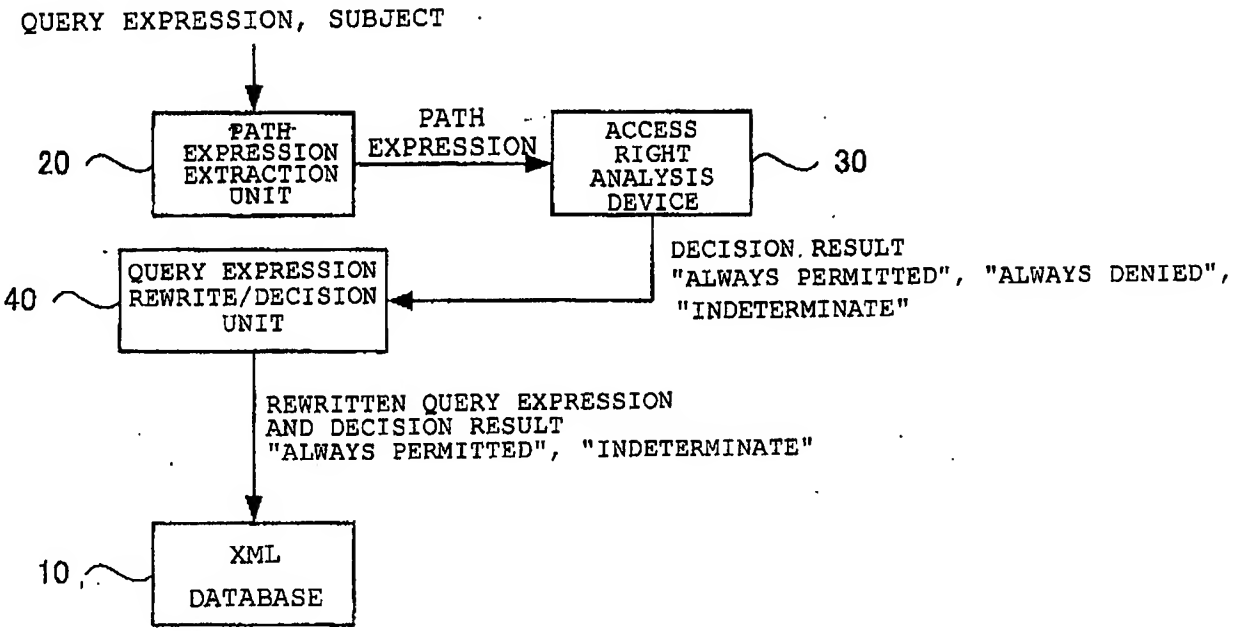
QUERY EXPRESSION, SUBJECT
20
PATH EXPRESSION EXTRACTION UNIT
PATH EXPRESSION
ACCESS RIGHT ANALYSIS DEVICE
30
DECISION RESULT "ALWAYS PERMITTED", "ALWAYS DENIED", "INDETERMINATE"
40
QUERY EXPRESSION REWRITE/DECISION UNIT
REWRITTEN QUERY EXPRESSION AND DECISION RESULT "ALWAYS PERMITTED", "INDETERMINATE"
10
XML DATABASE

FIG 17

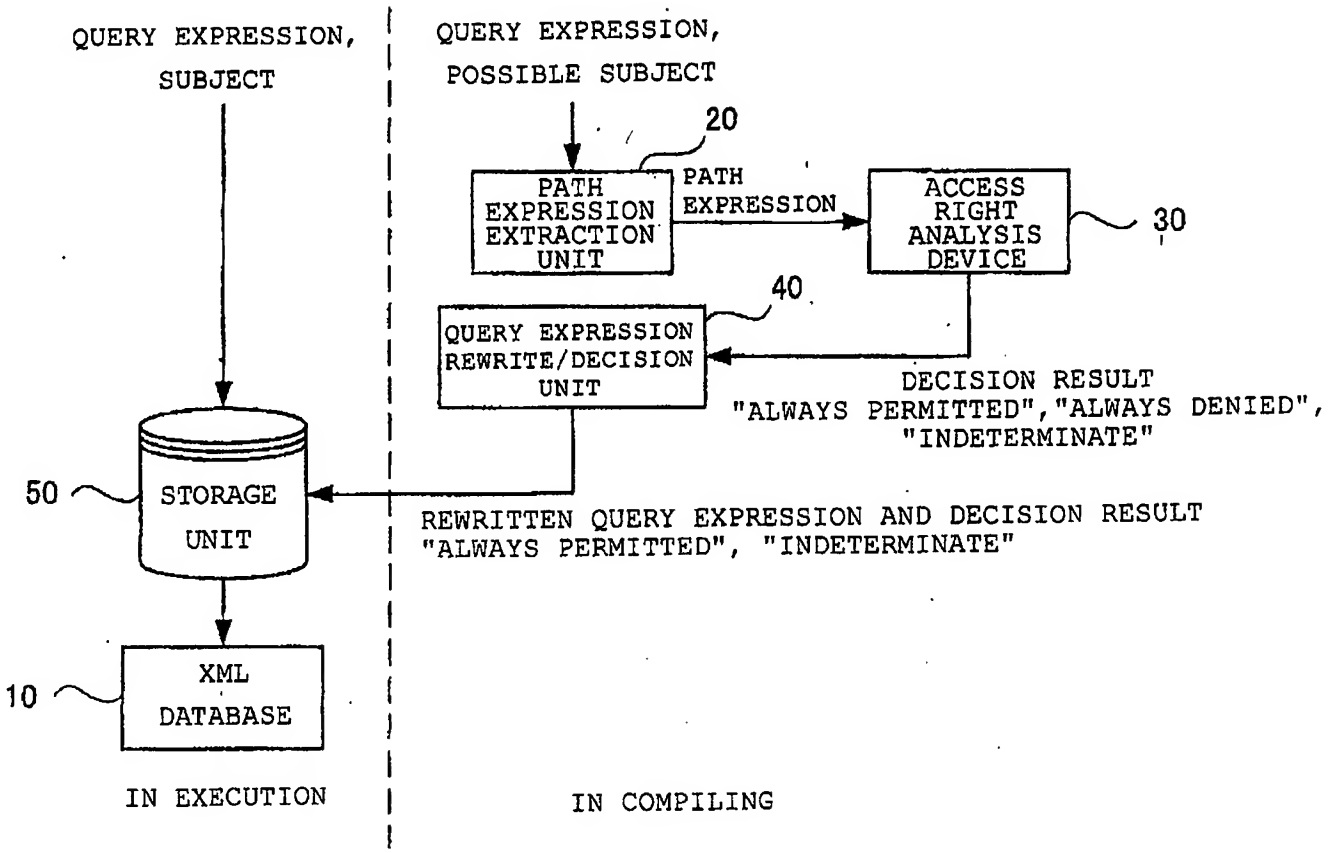
QUERY EXPRESSION,
SUBJECT
QUERY EXPRESSION,
POSSIBLE SUBJECT
20
PATH EXPRESSION EXTRACTION UNIT
PATH EXPRESSION
ACCESS RIGHT ANALYSIS DEVICE
30
40
QUERY EXPRESSION REWRITE/DECISION UNIT
DECISION RESULT
"ALWAYS PERMITTED","ALWAYS DENIED",
"INDETERMINATE"
50
STORAGE UNIT
REWRITTEN QUERY EXPRESSION AND DECISION RESULT
"ALWAYS PERMITTED", "INDETERMINATE"
10
XML DATABASE
IN EXECUTION
IN COMPILING

FIG 18